PLANTING SOUTHERN PINES

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Pulpwood, poles, sawlogs, piling, and in some places naval stores can be grown on many cut-over timberlands and abandoned or eroding fields in the southern pine region, even though trees of the desirable species do not seed in by themselves. Planting slash, loblolly, longleaf, or shortleaf pine on such lands is usually neither difficult nor expensive if a few simple directions are followed, especially if the directions can be checked against the methods already used successfully in nearby plantations. An experienced man can plant 100 to 200 trees an hour, and total costs need seldom be higher than $4 or $5 an acre.

It is usually better to plant small seedlings than to sow pine seed. Plantations made with 1-year-old nursery stock usually grow faster the first few years than do stands from direct seeding (fig. 1).

Successful planting of southern pines requires (1) soil on which the pine in question will grow; (2) fresh, healthy, high-grade seedlings uninjured in digging and shipping; (3) proper spacing; (4) adaptation to known weather conditions; (5) suitable tools; (6) careful setting of each tree in as natural a position in the ground as possible; and (7) protection from injury, especially by fire.

Sites and Species

Much can be learned about choice of land to plant and choice of species by studying the various species on similar soils nearby. Some species of southern pine can be planted successfully on almost any land formerly in pine and on many farmed-out soils originally in upland hardwoods. Planting is least worth while on soils too poor for rapid growth of pine and on bottom-land soils on which the pines may be crowded out by fast-growing hardwoods. It is most worth while on good land restocking too slowly (as from lack of seed trees nearby) or requiring a thick cover to control erosion.

Slash and loblolly pine seedlings are the easiest to raise in the nursery. Planted slash pine appears to suffer more wind throw than loblolly, but it is less seriously injured by fire and insects and has the further advantage of yielding naval stores. Its natural range is much smaller than that of loblolly; but within its range, it appears to grow better than loblolly on areas with a shallow surface soil, where the original forest was pure longleaf pine.

Longleaf pine is more difficult to grow in the nursery than slash and loblolly and is slower in starting height growth in the plantation. It must be protected against hogs; and it is more susceptible than the other pines to a needle disease called brown spot, by which it is often injured and sometimes killed. It is less easily injured by fire than any other southern pine. As a rule, planting of longleaf is more likely

[1] This leaflet is a revision of and supersedes Leaflet 32, Planting Southern Pine.

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to interest lumber companies or Government agencies owning large tracts of cut-over longleaf land than owners of small tracts.

Shortleaf pine does fairly well in certain localities where other species grow poorly or not at all and is preferred for such locations. It sometimes requires 2 years in the nursery to reach planting size.

FIGURE 1.—A slash pine plantation made with 1-year-old nursery stock, shown 11 years after planting. The same trees, 3 years and 8 years after planting, are shown in the pictures on the cover.

It suffers from the same insects and diseases as loblolly but sprouts from the stump if killed back by fire when young.

When there is doubt about which species to plant, or enough of one species to cover the entire area is not obtainable, it is well to mix two species—preferably three rows of one and three of the other rather than single rows of each. Such a mixture may prevent total loss from

some insect or disease attacking a single species and is thought to produce healthier, better-formed trees. Even longleaf, despite its delayed height growth, can be mixed with other species if planted in three-row strips.

Planting Stock

One-year-old nursery-grown seedlings are preferred for planting. The State departments of forestry of most of the Southern States maintain forest nurseries from which stock may be obtained at cost; orders should be placed in late summer or early fall. Seedlings can also be grown in smaller private nurseries.[2] Seedlings that have come up on old fields or along roads near the planting site have been used

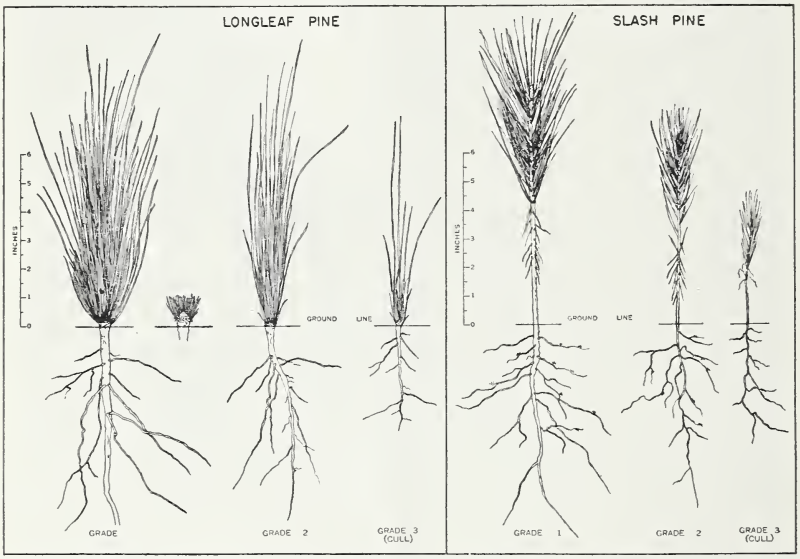

FIGURE 2.—Grades of slash and longleaf pine seedlings; grade-3 seedlings should be culled. The three grades of loblolly and shortleaf are much like those of slash pine.

with good success, especially if grown in full sunlight and transplanted with earth still around their roots. On the whole, however, such wild stock is likely to cost more and to give less satisfactory results.

Each species of southern pine appears to contain several varieties or strains, each suited to the local conditions of temperature, rainfall, soil, and attacks of insects and disease. For this reason, the planter should order stock from seed collected near his planting area, or at least in a place having much the same temperature and rainfall. One advantage of stock from home-collected seed, and even of local wild seedlings, is that the planter can be sure the seed source is all right.

Ordinarily only seedlings of grades 1 and 2, as described in table 1, are shipped and planted; grade-3 seedlings are culled (fig. 2). Seedlings of grades 1 and 2 survive and grow almost equally well on good sites, but on medium and poor sites the better qualities of grade-1 stock show up. Even on the best sites, survival and growth of grade-3 seedlings are usually too poor to justify planting.

[2] For directions see U. S. Department of Agriculture Leaflet 155, Growing Nursery Stock of Southern Pines.

TABLE 1.—*Grades of uninjured, 1-year-old southern pine seedlings* [1]

Grade	Usual heights [2] (inches)	Thickness of stem at ground (inch)	Nature of stem	Bark on stem	Needles	Winter buds
LONGLEAF						
1	12 to 16	¼ to ½ or larger			Abundant. Almost all in 3's or 2's.	Usually present; usually with scales.
2	8 to 15; 6 to 8 if stem and buds are good.	At least 3/16			Moderately abundant; at least part in 3's or 2's.	Buds with scales usually lacking; some without scales usually present.
3	Less than 8	Less than 3/16			Scanty; short; often none in 3's and 2's.	Not present.
SLASH						
1	6 to 14	3/16 or larger	Stiff; woody	Usually on entire stem	Almost entirely in 3's and 2's.	Usually present.
2	5 to 8; sometimes 12	At least ⅛	Moderately stiff	On lower part at least; often all over.	Part at least in 3's and 2's	Occasionally present.
3	Usually less than 6	Less than ⅛	Weak; often juicy	Often lacking	Practically all single; usually bluish.	Almost never present.
LOBLOLLY						
1	5 to 12	3/16 or larger	Stiff; woody	Usually on entire stem	Almost entirely in 3's	Usually present.
2	4 to 7, sometimes 10	At least ⅛	Moderately stiff	On lower part at least; often all over.	Part at least in 3's	Occasionally present.
3	Usually less than 5	Less than ⅛	Weak; often juicy	Often lacking	Practically all single; usually bluish.	Almost never present.
SHORTLEAF						
1	4 to 10	About 3/16	Stiff; woody. Usually a crook at ground level; often branching.	Usually on entire stem	Almost entirely in 3's and 2's.	Usually present.
2	3 to 6, sometimes 8	About ⅛	Moderately stiff; often with crook and branches.	On lower part at least; often all over.	Part at least in 3's and 2's.	Occasionally present.
3	Usually less than 4	Distinctly less than ⅛	Weak; often juicy; often straight.	Often lacking	Practically all single; bluish.	Practically never present.

[1] Any seedlings with roots less than 6 inches long should be considered as grade 3 (culls), regardless of the quality of the tops.
[2] Needle lengths of longleaf pine seedlings; stem lengths of other 3 species.

In grading seedlings exact height is less important than the kind and number of needles, the thickness and stiffness of stem, the bark at the ground line, and, usually, the winter buds. Very small seedlings are undesirable even if their needles, etc., fit the descriptions of the two higher grades. On the other hand, seedlings can be too large.

Pruning the roots in the nursery is usually necessary to make them fit the holes made by the planting tools, and to get rid of stripped, ragged, and broken ends. Eight inches is the most generally satisfactory length; 6 inches is the shortest permissible; and on light soils, which dry out rapidly and in which holes are easily made, roots 10 to 14 inches long may be most satisfactory.

Spacing

Spacings used successfully and the resulting number of trees per acre in plantations of southern pines are as follows:

Spacing (feet)	*Trees per acre (Number)*
5 by 5	1, 742
6 by 6	1, 210
7 by 7	889
8 by 8	681
10 by 10	436
12 by 12	302
6 by 8	908
6 by 10	726

The closer spacings result in earlier meeting of the tree crowns, slower diameter growth, smaller knots, and earlier shedding of branches than do wider spacings. Planting seedlings closer costs more per acre both for trees and for labor. Closer spacings are preferred for erosion control and for the production of high-quality lumber, particularly if pulpwood or some other small products from early thinnings will pay back part of the higher cost. Wider spacings, in addition to being cheaper, are preferred for slash and longleaf pines planted for naval stores because the rapid growth permits early chipping and open-grown, wide-crowned trees produce the most gum. Spacings 6 by 8 and 6 by 10 feet reduce the number, and hence the cost, of furrows on soil needing this form of preparation; and the 6 by 10 spacing is convenient because trucks can be driven between rows.

Season and Weather

Pine seedlings should be planted after the tops have stopped growing and before new growth has started and at a wet rather than dry time of year, but not during freezing weather. On warm, dry, or windy days the roots need extra care to keep them moist.

In the South Atlantic and Gulf Coast States the planting season usually includes December and January but may begin in November and extend to the middle or end of February. Farther north, freezing winter weather makes early spring the best season for planting. Early planting (December) seems especially desirable in northern Florida and southern Georgia and Alabama, where the spring season is apt to be dry.

Preparation of Site

Firebreaks and fences should be put in before the trees are planted. Except for these, no preparation of the site is needed unless unusually

hard soil must be broken up, heavy brush or grass cleared away, erosion temporarily checked, or droughty soil furrowed to collect moisture for a few weeks before planting. On most sites furrowing, hoeing spots, or burning off the grass have been found unnecessary and sometimes even harmful.

Planting Tools and Methods

Southern pines can be planted successfully with almost any tool that will open a slit or hole large enough for the root system and will close the soil firmly about the roots.

A favorite planting bar has a wedge-shaped blade 10 inches long, 3½ to 4½ inches wide, and ¾ inch thick where it joins the handle, to which a small step may be welded. The handle ends in a D-grip or T-grip. The length over all is 42 to 45 inches, and the usual weight 10 pounds. Such a bar can be bought from various tool companies or made by any blacksmith. Each tree is planted in a slit made by the blade, and this first slit is closed by a second about 4 inches behind it, and by the planter's heel. In bar planting men work either singly or in pairs, preferably singly. Other tools in common use are mattocks, grub hoes, and several kinds of shovels. Pails, trays, or baskets of some kind are needed for carrying seedlings during the planting.

Care of Stock

Seedlings must be kept moist and sheltered all the time between lifting and planting, but not to the point of smothering. State nurseries ship stock packed in moist bog moss (sphagnum) or in cypress "shingle tow," or baled or wrapped in waterproof burlap or waterproof paper. Seedlings can be moved short distances if thoroughly wetted and packed in layers, with wet sacks above and below.

Seedlings in shipment or awaiting planting should be watered if there is any danger of their drying out or beginning to heat. Shipments of seedlings from a distance should always be examined carefully before they are watered, lest some have spoiled by drying.

The sooner lifted seedlings are planted, the better; the most successful planters have kept much of their stock out of the ground less than 1 day. If absolutely necessary, however, seedlings can usually be kept safely for a week or two by heeling them in in light loamy or sandy soil. To heel in planting stock, dig a trench about 3 inches deeper than the length of the roots, with one side sloping a little; pack the stock against this side in a layer 3 to 5 inches thick, with roots unbent and tops sticking up; and cover the roots and lower parts of the tops with firmly packed earth.

During planting, the roots must be kept wet.

Actual Planting

In actual planting, the important things are (1) to keep the roots moist; (2) to avoid skinning or breaking them; (3) to get them straight and well spread in the slit or hole; (4) to keep leaves and other trash out of the hole; (5) to set the tree the same depth in the ground that it grew in the seedbed; and (6) to close the earth firmly about the roots.

Of these, No. 5 is one of the most important. A change from greenish bark above to yellowish below shows the original ground

line of the seedling. The only exception to setting this at ground level in the plantation is in the case of longleaf pine on bare or nearly bare soil. On such soil, longleaf seedlings should be set up *at most* ½ inch higher than they grew in the nursery, to keep dirt from washing in on top of the bud.

If care is taken with these points, the exact tool and the method of using it make little or no difference so far as survival and growth are concerned. A good farmer, well acquainted with the soils on which he is planting, and keeping these points in mind, can often improve existing methods for local use. A little study will usually show how to reduce a good planting method to the fewest possible motions, which will not only save time but increase survival and growth.

Protection of Plantations

Complete control of fire is necessary to success in planting. Livestock must be kept out the first few years, especially goats and sheep, and hogs if the plantings include longleaf pine. Other causes of injury are rabbits; leaf-cutting red ants ("town ants," very serious in parts of Louisiana and Texas); pocket gophers ("salamanders"); Nantucket tip moth; sawfly larvae; brown spot (a needle disease, most serious on longleaf pine less than 2 feet high); and one or more species of *Peridermium* causing cankers or galls on the branches or main stems. These various causes of injury either are not serious enough to prevent reasonable success in planting, or, as in the case of leaf-cutting ants, can be controlled if they do become serious. The United States Department of Agriculture, at Washington, D. C., will be glad to supply the latest information available concerning treatments.

If the best method of site preparation or of planting, the best species for the site, or the suitability of the grade of stock available is in doubt, it is an excellent plan to include in the plantation a few rows planted to some other species or grade of stock or by some distinctly different method. Often such tests not only show the reason for low survival or poor growth during a certain year but make it possible to avoid these difficulties the next. Some kind of short written record of these tests should be kept, and it is always well to keep a written record of the date and location of every plantation, the methods used, the source of the stock, and if possible the source of the seed from which it was grown.

Further Information

Further information on forest planting can be obtained from the United States Forest Service, Washington, D. C.; from the State foresters at Montgomery, Ala., Little Rock, Ark., Tallahassee, Fla., Atlanta, Ga., New Orleans, La., Baltimore, Md., Jackson, Miss., Raleigh, N. C., Oklahoma City, Okla., Columbia, S. C., Nashville, Tenn., and College Station, Tex.; and information on forest planting on farms, from the extension forester at the State agricultural college of each State.

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